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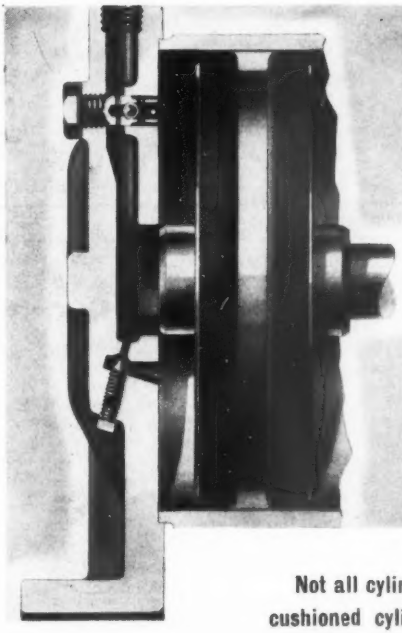

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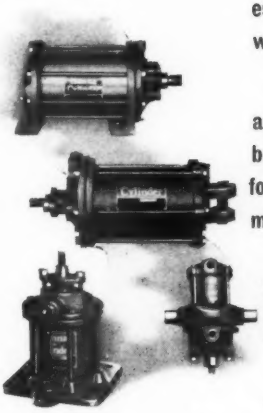

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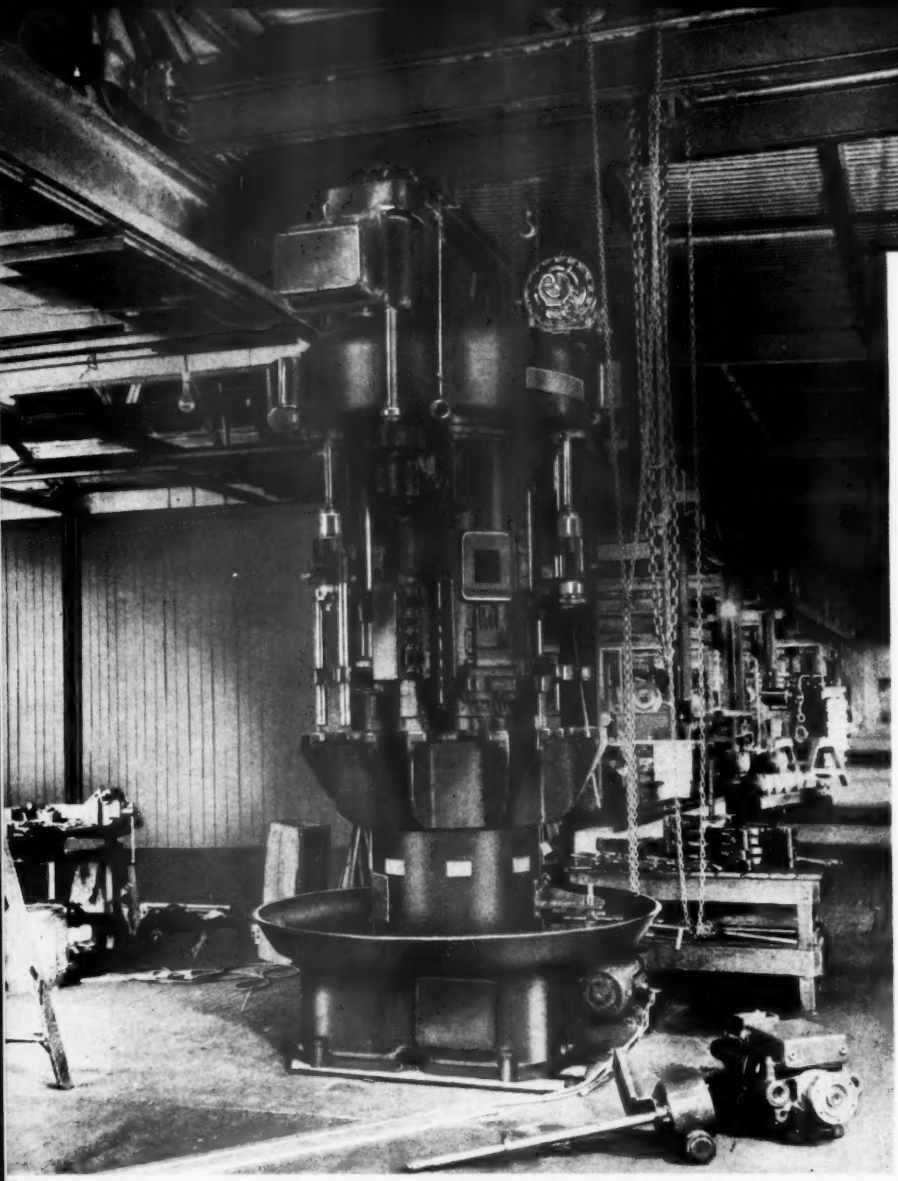

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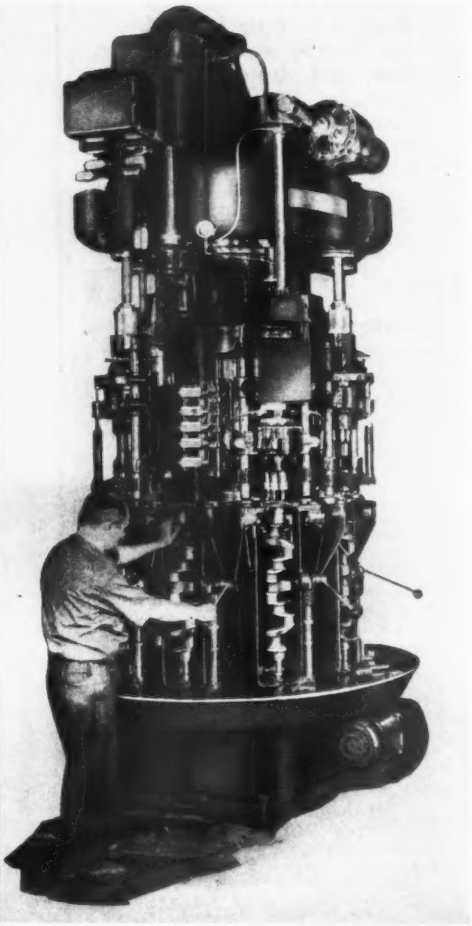

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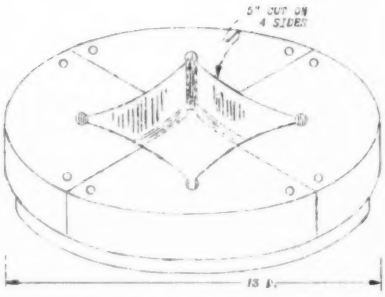

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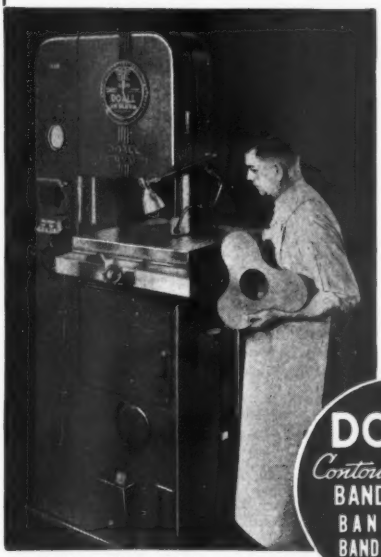

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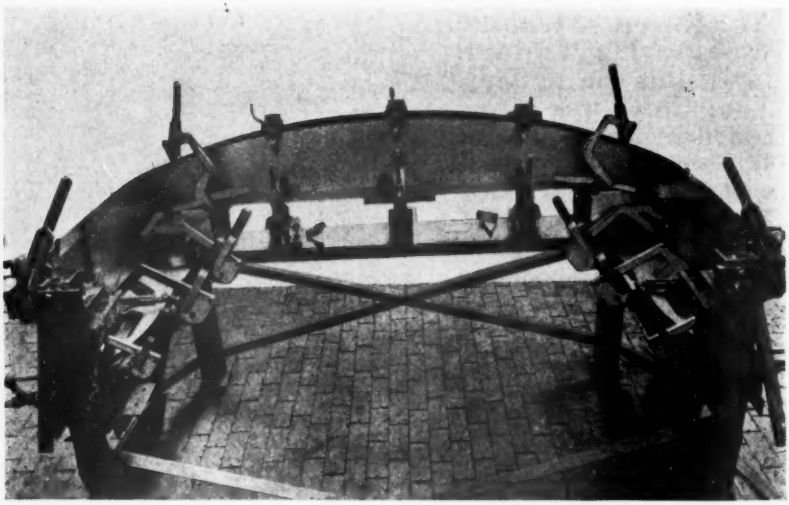

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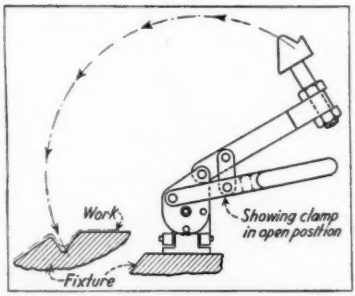

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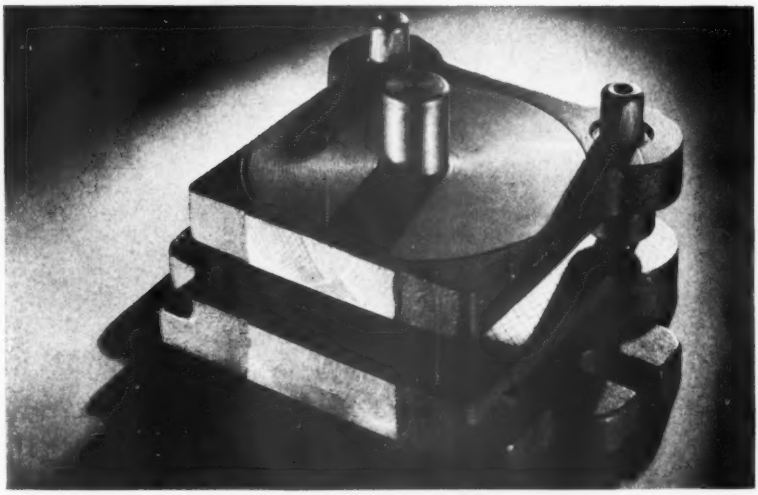

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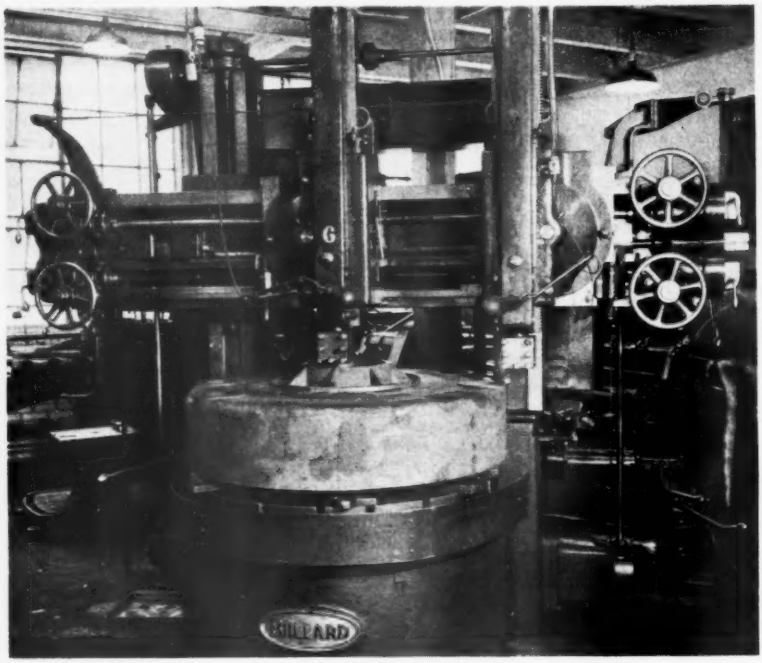

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Tool • Die • Machine **PROGRESS**

The National Tool and Die Journal

October, 1939 Vol. 5, No. 7

A **Reader Requested** Article

A Jig for Drilling in Two Different Planes

By Edward Heller
Chief Tool Engineer
Ohio Tool Company

THE requirement to build a precision jig to drill the two holes C and D, in the small cast iron bracket shown in Fig. 1, presented some interesting problems in design, particularly in mathematics. As will be seen from the accompanying drawing, the casting can be located very nicely on the two slots E-E, and clamped securely on face F-F, but the drilling has to be done in two separate and distinct planes. It was the determination of these planes, and the location of the drill bushings with reference to them, that made the problem somewhat complicated.

It will be noted that the two bosses, in which the two holes C and D are to be drilled, are dimensioned by angles in two planes at right angles to each other. So the first step in the work was to determine a resultant single angle in a different plane for each hole. This was

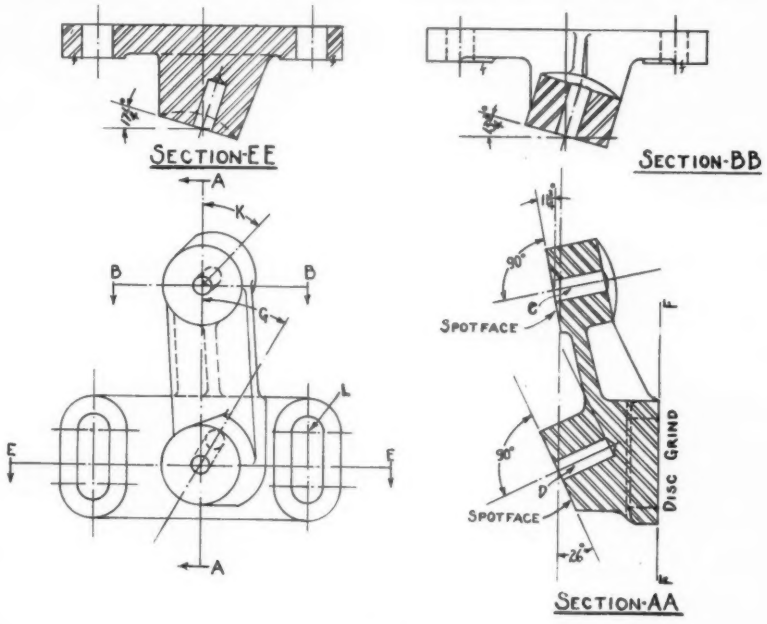


Fig. 1

done by a pair of formulae which the writer developed and has used many times in the past. Fig. 2 shows that solution in a diagrammatic way.

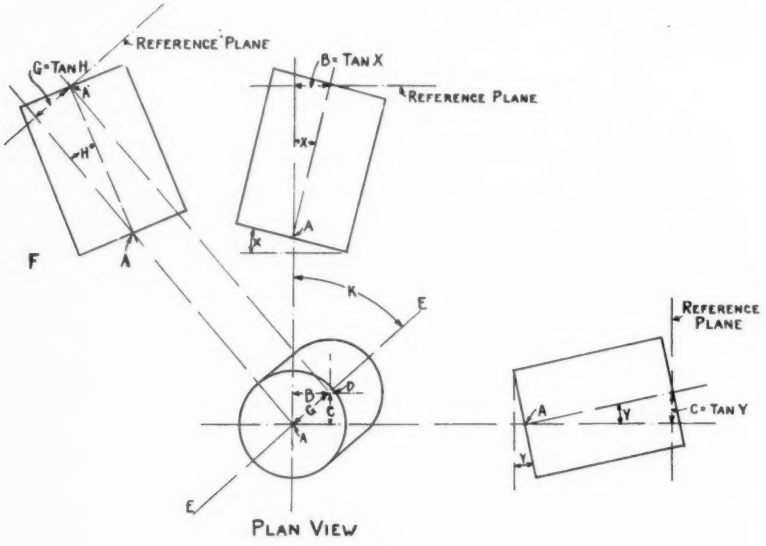


Fig. 2

Assume the two angles given in the production drawing to be X and Y. Then if we assume a reference plane a unit distance away from the point A, B will equal Tan X, and C will equal Tan Y. It is evident that if the projection of point A moves in one view in the direction of angle X and in the other view in the direction of angle Y it will end up at the intersection of B and C in the plan view, i. e. at D. In other words, it will be in the direction of E-E and form the angle K with the original center line. And the solution for that angle is Tan $K = \frac{\text{Tan } X}{\text{Tan } Y}$. In the case of the hole in boss C in Fig. 1, Tan $K = \frac{\text{Tan } 13\frac{3}{4}^\circ}{\text{Tan } 11\frac{3}{4}^\circ} = \frac{.24470}{.20800} = 1.1757$ and $K = 49^\circ\ 37'$.

The next problem is to determine the inclination of A-A, Fig. 2, in the plane E-E. This will be evident from the projection at F. Since we are still maintaining the same reference plane, the line G will be the Tan of angle H. And by referring to the plan view (Fig. 2) we can see that $G = \sqrt{B^2 + C^2}$. So Tan $H = \sqrt{\tan^2 X + \tan^2 Y}$ and again in the case of the boss C, Fig. 1, Tan $H = \sqrt{\tan^2 13\frac{3}{4}^\circ + \text{Tan}^2\ 11\frac{3}{4}^\circ} = \sqrt{.24470^2 + .2080^2} = \sqrt{.05988 + .04326} = \sqrt{.10314} = .3211$ and $H = 17^\circ\ 48'$. Similarly for angle G, Tan $G = \frac{\text{Tan } 17\frac{1}{4}^\circ}{\text{Tan } 26^\circ} = \frac{.31051}{.48773} = .63666$. And $G = 32^\circ\ 29'$. Angle J for the lower boss, similar to H, is determined in the same way. Tan $J = \sqrt{\text{Tan}^2\ 17\frac{1}{4}^\circ + \text{Tan}^2\ 26^\circ} = \sqrt{.31051^2 + .48773^2} = \sqrt{.0964 + .2379} = \sqrt{.3343} = .5782$ and $J = 30^\circ\ 2'$.

These calculations give the angular positions of the two holes to be drilled. Next these angular positions have to be definitely established with relation of the face F-F and a center in one of the slots, such as L in Fig. 1, in order to locate the drill bushings and to clamp the casting in a drill jig.

To accomplish this, the true center

(Continued on page 36)

Die Designing and Estimating

Advanced Series

X

By GEORGE DANNES

George Dannes is superintendent and engineer of the Permoflux Corporation of Chicago, and instructor in the advanced class studying Die Designing and Estimating at the Carl Schurz High School under the auspices of the Chicago District of the Special Tool, Die and Machine Shop Institute.

The value of the Dannes method of estimating lies in the development of a systematic procedure for pre-determining the hours of labor required for machining the parts of a die and then assembling them. The tables of time values have been developed from actual shop records and they supply dependable bases upon which to estimate. The values, as have been pointed out before, are *average* values based on average workers in an average shop. All tables referred to have appeared in previous installments of this series.

Next month we will design and estimate a die of the compound type construction. —*The Editor.*

THE METHOD APPLIED TO A PROGRESSIVE PIERCE AND CUT-OFF DIE

IN describing this method of pre-determining the number of hours required for machining and assembling a die and thus estimating its cost, we have heretofore used a comparatively simple blanking die. We will proceed now to apply the rules to more complicated ones.

Fig. 29 is a drawing of a sheet metal part for which a die is required. The material is to be cold rolled steel (CRS), .050 of an inch thick. The dimensional tolerance specified is plus or minus .005 of an inch (± .005") and the quantity 100,000 pieces.

As pointed out earlier, it is important that the estimator have a fundamental knowledge of die making so that he can visualize the machine and hand work necessary for construction of the die parts. A careful study of the piece to be produced reveals that three types of dies are usable, namely:

1. A progressive piercing and blanking die
2. A compound die
3. A progressive pierce and cut-off die

The choice should be made from the standpoints of comparative construction cost and production efficiency. The first named die would be designed to provide for at least three steps to progressively pierce and blank the piece:

a. Punching the three perforator holes and the horizontal rectangular opening of the T slot
b. Cutting the vertical opening of the T slot by the use of two of the previously punched perforator-holes for pilot guides
c. Cutting the outline of the blank and pushing it through the die

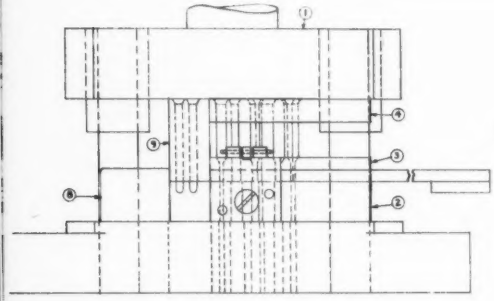
These three steps would require three openings to be machined. The compound type could be used but an objection which

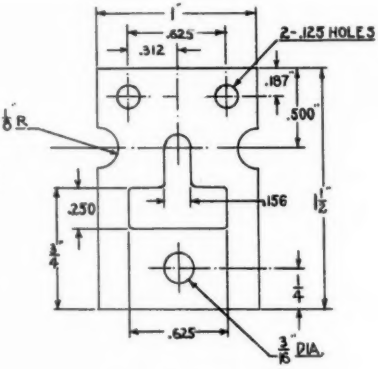
should eliminate it is that it does not make a really efficient and dependable punch and particularly for the quantity specified.

The third type, the progressive pierce and cut-off die, lends itself perfectly for the job. Although it also must provide for three steps, its design and construction are more simple, only two die openings being required.

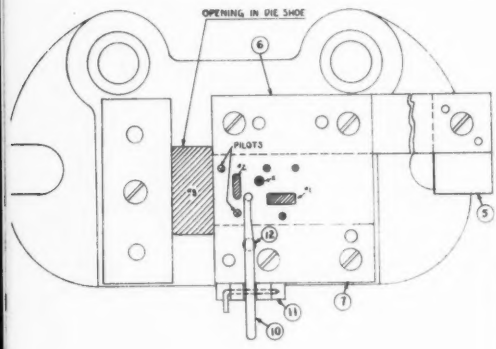
Fig. 30 is a drawing of this type of die designed for producing the part shown in Fig. 29. Briefly, it operates as follows:

The stock is fed against stop No. 10 in its first step. Here are punched the three perforator holes, the horizontal part of the T slot and the hole X, which in the cut-off position is cut in half to provide the blank with the half circle cut-outs shown on each side. In the second step the stock is again located by means of the stop which registers in the rectangular cut-out which has been

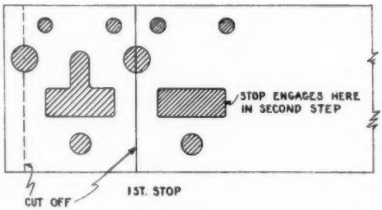




MAT. .050 CRS.



Above, Fig. 29—Piece Part. Left, Fig. 30—Progressive pierce and cut-off die. Below, Fig. 31—Strip of material before first blank is cut off.



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5—STOCK REST 5/16" x 1¼" x 2" CRS
6—BACK GAGE ¼" x 1¼" x 12" CRS
7—FRONT GAGE ¼" x 1¼" x 3½" CRS
8—HEEL 11¼" x 1½" x 4" OHTS
9—CUT-OFF PUNCH 1¾" x 1¾" x 2¼" OHTS
10—STOP
11—STOP HOLDER ⅜" x 1½" x 1¾" CRS
12—SPRING

MATERIALS FOR PARTS
"All working parts OHTS"

DIE BLOCK	OHTS
PUNCH PAD	CRS
STRIPPER	CRS
PUNCHES	OHTS
BACK GAGE	CRS
FRONT GAGE	CRS
HEEL	OHTS
STOP HOLDER	CRS

cut in the first step. This is not an automatic stop and is used only when starting a new strip for the first two steps. In the second step the vertical half of the T slot is cut, using two perforator holes as pilot guides and also the blank is trimmed to its correct width by cutting away the material needed to start the strip. This prevents shearing of the perforator which provides the blank with the half circular cut-outs.

In the third step—the cut-off position—the strip is fed against the heel (No. 8) which now becomes the locator or stop and which also backs up the cut-off punch (No. 9) preventing it from moving away from the die cut-off edge. After being cut off the blank drops through a clearance hole in the die shoe and on through the press. The part is now finished. Simple, foolproof, this die in a modern press assures continuous, accurate production.

As for the construction of the die, a backliner pin die set (No. 1) was selected. The die block thickness has to be at least 1 inch.[1] Oil hardening tool steel (OHTS) was selected for all working parts. The stripper (No. 3) is of the "solid" type, because no hold-down pressure is required. The punch pad (No. 4) is ½" cold rolled steel (CRS) and in it are mounted all the perforators and punches except the cut-off punch (No. 9) which is mounted directly on the punch holder.

The back gage (No. 6) is made somewhat longer than the front gage (No. 7) and is provided with a stock rest (No. 5). The stop (No. 10) is mounted on the front of the die by means of the stop holder (No. 11), a spring (No. 12) keeping the stop in a disengaged position.

Fig. 31 shows how the strip of material looks before the first blank is cut off.

So much for the design of the die. We are ready now to estimate its cost and for recording the figures we use a standard estimating form shown in Fig. 32. Extreme care must be used to make certain that *all* die parts are listed in the column at the left. Then proceed, considering Group A, the machining operations first.

DIE WORK ESTIMATING SHEET

	A	B	C	D	E	F
DIE BLOCK	.6 .8	.9 .4				1.5
DIE No. 1			.4	4.0 .4		
DIE No. 2			.4	4.0 .4		
PUNCH No. 1				2.8		1.0
PUNCH No. 2				2.0		1.0
PUNCH No. 3	.4 .6	.4		3.5	.8	1.0
PUNCH PAD	.4 .3	.7		1.2 .8		1.5
STRIPPER	.4	.7		.8 .8		
BACK GAGE	.5	.8				.5
FRONT GAGE	.3	.5 .1				.5
STOCK REST	.2	.4				
PERFORATORS			.8		1.0 .7 .7 3.6	2.0
PILOTS			.4		2.8 1.8	2.0
HEEL	.5 .7	.4				.5
STOP					3.0	
STOP HOLDER	.2	.4		.6		.5
PUNCH HOLDER		1.0				
DIE SHOE		1.0	.4	1.2 .8 1.5		2.5
TRYOUT						2.5
INSPECTION			1.8			
	5.9	7.7	4.2	24.8	14.4	17.0

Total — 75 hours

Fig. 32

[1]Fig. 2, February issue, page 16.

Group A—Machining

Always start with the die block. Our block 1" x 3½" x 4" needs .6 hour for squaring, plus the grinding time (100% of squaring time value plus .2 hour for 2 set-ups equal .8 hour) a total of 1.4 hours.[2] As it may be necessary to check back, it is usually an advantage to enter these values separately. Enter them opposite Die Block in Column A.

Punches No. 1 and No. 2 are too small to require the figuring of machining time, therefore are omitted. Punch No. 3 is the cut-off punch and its dimensions are 1¼" x 1¾" x 2¼". From the same table, using the closest dimensions of 1" x 2" x 2", we determine the machine time value is .4 hour. The grinding time value including two set-ups (punches are OHTS) would be .6 hour, a total of 1.0 hour. Enter these on the estimating sheet.

The punch pad or plate has dimensions ½" x 3½" x 4". Again the closest dimensions in the table (½" x 4" x 4") give a time value of .6 hour. But because the pad is made of cold rolled steel (CRS) only 70% of the table value is used or .4 hour. Add the grinding time (50% for one grinding operation plus .1 hour for the single set-up) of .3 hour. Put these values, .4 and .3 hours, opposite Punch Pad in Column A.

The stripper requires only machining —no grinding. The closest table dimensions are ½" x 3" x 4". Being made of cold rolled steel (CRS) we use 70% of .5 hour or .4 hour. (Actually .35 hour but in all instances use the next higher decimal).

Closest table dimensions for the back gage are ½" x 1" x 12" for which the table value is .7 hour but again cold rolled steel (CRS) requires only 70% of that time or .5 hour. Closest table value for the front gage is ½" x 1" x 3" and 70% of .4 hour equals .3 hour. Enter these values in Column A.

The heel being made of oil hardening tool steel, with closest table dimensions 1" x 2" x 4", requires .5 hour for machining plus 100% for the two grinding operations and .2 hour for the two set-ups. Enter .5 hour and .7 hour in Column A.

The stop holder is the last of the parts which requires such machining and because it is of small dimensions we use the minimum table value .3 hour of which 70% is .2 hour. Enter this in Column A.

Group B—Holes

It will be noted from the drawing that no screw or dowel hole needs to be larger than ⅜". There are 4 holes for dowel pins and 4 for screws in the die block. The Time Value Table for Drilling, Reaming and Tapping[3] shows .1 hour for each hole and .1 hour for the set-up for the group of holes, a total of .9 hour. The stop holder is also mounted on the die block requiring 1 screw and 2 dowel pin holes or .3 hour to which must be added .1 hour because a new set-up is required. Total .4 hour. Enter these values opposite Die Block in Column B.

Punch No. 3 requires holes for 1 screw and 2 dowel pins—.3 hour plus .1 hour or .4 hour.

The following require holes as noted:

Punch pad—2 dowels, 4 screws and set-up—.7 hr.

Stripper—2 dowels, 4 screws and set-up —.7 hr.

Back gage—2 dowels, 2 screws to which add holes for 2 dowels and 1 screw to mount stock rest. Add set-up—.8 hr.

Front gage—2 dowels, 2 screws and set-up .5 hr. to which add .1 hr. for receptacle hole for stop actuating spring. Total .6 hr.

Stock rest—3 holes plus set-up—.4 hr.

Heel—2 dowels, 1 screw and set-up—.4 hr.

Stop holder—2 dowels, 1 screw and set-up—.4 hr.

Enter each time value in Column B.

The punch holder mounts both the punch pad and the cut-off punch (No. 3) and requires drilling of the same number (9) of holes. At .1 hour per hole plus .1 hour for set-up, the time value to enter in Column B is 1.0 hour.

The die shoe mounts both the die block —2 dowels and 4 screws—and the heel— 2 dowels and 1 screw. Time value including set-up time is 1.0 hour. Enter in Column B.

(Continued on page 20)

[2]Fig. 6, March issue, page 15.

[3]Fig. 7, April issue, page 17.

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Die Designing and Estimating

(Continued from page 18)

Group C—Die Layout and Inspection

Earlier in the text it was emphasized that the determination of layout and inspection time values[4] is particularly important because the contour characteristics of the part which is to be made form not only the basis of those estimates but also of the important D group of machining operations.

Because dies No. 1 and No. 2 are both laid out in straight lines each consists of 4 units and requires .4 hour. Each die has 2 pilots or 4 units which require .4 hour. Two units are specified for each perforator and pilot, the 4 perforators equal 8 units and the time is .8 hour. The rectangular clearance hole which is required for the blank to pass through the die shoe consists of 4 straight lines and 4 small radii in the corners. The radii being less than ¼" are not considered, therefore the time required is based on 4 units or .4 hour.

Time required for inspection of die parts is closely related to the shape of the part and the specified tolerance. Closer tolerances require more frequent inspection and consequent interruptions of machining. Dimensions in this instance must be held to plus or minus .005", therefore .5 hour should be added for inspection of each die opening but no inspection time is allowed for perforators or pilots because .2 hour is sufficient to include locating them.

The only inspection time to be entered on the estimate sheet therefore is for the 2 die openings as follows: .4 hour plus .4 hour plus 1.0 hour (2 at .5 hour), a total of 1.8 hours.

Group D—Machining, Finishing and Fitting Punch, Openings for Die, Die Shoe, Punch Plate and Stripper

Having analyzed the product piece according to its prescribed units of form the time values are arrived at by reference to their respective tables.[5] To illustrate, die opening No. 1 consists of 4 contour units which require 4 hours for machining to which add .4 hour for finishing because the specified tolerance is ± .005".

Die opening No. 2, although its perimeter is somewhat smaller, falls into the same dimensions and consequently the same time values apply—4 hours for machining and .4 hour for finishing. Enter values in Column D.

Punch No. 1 is of type 1 construction[6] size 2" and consists of 4 contour units. Time required, therefore, is 2.8 hours.

Punch No. 2 according to its dimensions requires 2 hours.

Punch No. 3, the cut-off, coming closer in size to 8" than 4", allows the larger amount of time—3.5 hours.

For estimating the time required to machine the openings in the punch pad, the same sizes and contour units are used. For punch No. 1 the time is 1.2 hours and punch No. 2, .8 hour.

The openings for clearance holes through the stripper require for punch No. 1, .8 hour and for punch No. 2, .8 hour.

The time value for removing material and mounting the stop holder is .6 hour.[7]

Table, Fig. 16, is referred to again to obtain the time value for machining the clearance hole for the slug through the die shoe. For punch No. 1—1.2 hours; punch No. 2, .8 hour; punch No. 3, 1.5 hours. Enter all of these values in Column D, which is then complete.

Group E—Perforators, Pilots, Accessories

There are two perforators of the same size—.125" diameter—and according to the table,[8] allow 1.0 hour for making. There are also two odd sizes—.156" and $\frac{5}{32}$"—each requiring .7 hour. Holes for these perforators[9] require .8 hour each, or 3.6 hours.

The four pilots each require .7 hour, total 2.8 hours for making. Add finishing of their clearance holes, 2 in the die block and through the die shoe—.9 hour each. Total 1.8 hours. According to table, Fig. 24,[10] time for mounting the two

(Continued on page 30)

[4]Figs. 9 and 10, April issue.
[5]Fig. 14, May issue; Figs. 1 and 16, June issue.
[6]Fig. 17, June issue, page 15; and Fig. 16, June issue, page 14.
[7]Fig. 19, July issue, page 12.
[8]Fig. 22, August issue.
[9]Fig. 23, August issue.
[10]Fig. 24, August issue.

Die Designing Courses Open

RALPH A. WAGNER, chief die designer, Truscon Steel Company, announces the opening of the fourth year of the practical course in die designing at the Cleveland Trade Night School the week of October 9th. The course, offered by the Cleveland Board of Education, is taught by the drawing board method, each student being given individual attention by the instructor and advanced according to his ability.

The class meets once weekly for 3½ hours and runs for 15 weeks. The course deals with blank developments, reductions in forming cups, designing, blanking, forming, drawing and piercing dies. Students are given part prints and die guides to start their designs. When advanced sufficiently, students work from part prints only, calculating the steel sizes and lining up the operations. The course, which is planned to build up practical experience in die design, is open to men over 18 years of age who have had at least elementary drawing experience and whose work is related to the subject.

Two Indiana schools, Designcraft at Indianapolis and Acme School of Die Design Engineering at South Bend, offer courses in tool and die design. The Designcraft School, offering evening and Saturday morning classes of three hours duration, is taught by experienced men employed in actual shop work. All students are entered in elementary classes. The average student is able to finish the elementary course in the fundamentals of tool and die drafting, lay-out, reading part drawings and blueprints in about four months. The advanced class progresses from the simplest blanking die to the most complicated cam action and deep drawing dies, also all types of jigs, fixtures and special machinery. H. F. Baker and B. M. Hollansworth are the instructors.

The Acme School of Die Design Engineering, now in its fourth year, is under the personal supervision of Stanley R. Cope, well known pressed steel engineer. Two classes, one in die designing and one in jig and fixture design, are offered. Classes run from September through June. The school prefers full time students who can complete the two-year course offered.

Young men interested in these schools, or for information regarding other tool and die designing classes closer to their communities, are invited to write the editor of this publication.

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Toggle Clamps Improve Drilling Fixtures

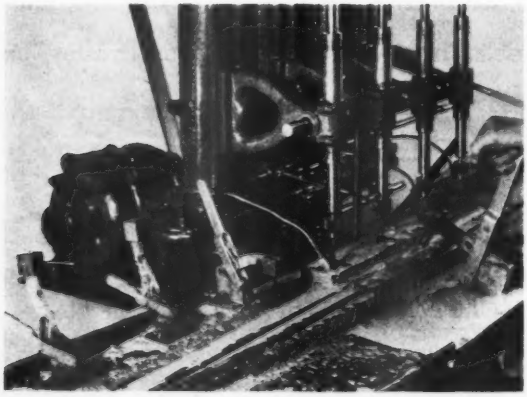
By Lyle L. Janisse, Manager
Finished Products Division
Detroit Stamping Company

THE introduction of the modern toggle clamp into the design of a simple or multiple drilling fixture will often assure greater speed in production, and the fixture itself may be built more economically. Herewith are illustrations of two such combinations.

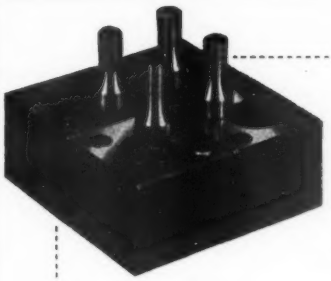
A hammer, hand punch, grooved fixture, clamp, template and small bench drill press provide the necessary equipment for a surprisingly rapid, yet extremely simple, method of accurately locating and drilling a series of unequally spaced holes. As shown in photograph at right, the work (steel strip) is placed into the grooved slot and the template locked in position by a hand clamp. The master holes in the drilled template allow accurate center punching. Quickly released, the clamp permits the work to be freely and rapidly removed from the fixture. With the punch marks as guides, the desired holes are drilled.

A higher production rate necessitated by volume requirements of this same part is obtained as detailed in the second illustration. A slotted fixture fastened to the table of a four spindle drill press, permits the stock to be easily slid into position. The clamp directly in front of

the spindles forces the work to the back of the fixture and holds it securely while the first series of holes are drilled. The toggle clamp is released and the stock guided on through to the second position determined by the first clamp to the left of the fixture. The pointed steel rod on the end of the clamp bar enters the first of the holes already drilled and is locked in place by the action of the toggle clamp. Now accurately located for the second series of holes, the piece is ready for a repetition of the initial operation.



Toggle clamps are easily and conveniently operated and afford a positive and secure means for holding stock in position. Rapid locking and releasing action offer the element of speed and simplicity to fixture design.



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Danley Kwik-Klamp Offers New, Exclusive Constructions

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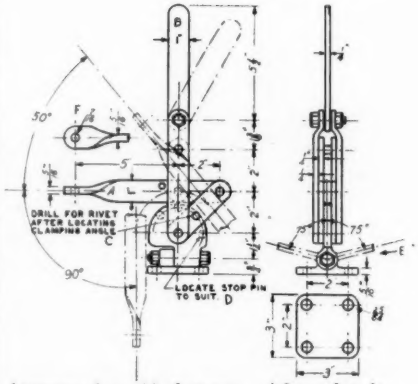
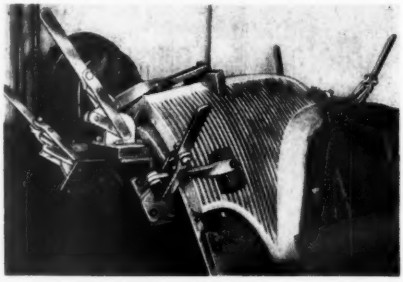
Key to the advantages is the new, exclusive swivel base. Any angle or compound angle can be obtained at the point of clamping with clamps mounted directly on flat or vertical faces of the die, jig or fixture. Expensive machining of angular pads is eliminated.

The adjustment of the operating handle to clear overhanging panels or for operating convenience, an important feature, is illustrated by the drawing. The clamping bar A is adjustable from the horizontal upward to 50 degrees and downward to 90 degrees. After the desired position of the clamping bar is determined, the bar is drilled for riveting through the hole provided in the angular member C. The stop pin D is located to suit the job as it merely determines the position of the clamp when open. The handle B, adjustable through 150 degrees, is then adjusted to position. The handle bolt is tightened, lock washers holding the handle securely in position.





The illustrated clamp shows the entire base mounted on the swivel E, providing side adjustment of 75 degrees in either direction. The swivel can be locked or left free to swing as desired.

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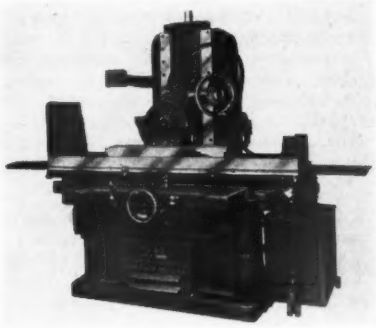

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(Continued on page 36)

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The Catalog Review

Brief descriptions of current industrial literature including technical booklets and bulletins, catalogs and circulars. All may be had upon request, without charge. . . . Please use identification numbers.

THE NEW, 10th EDITION DANLY CATALOG—listing extensions to the regular series of die sets, especially in larger sizes, a complete new series of square sets and two new lines of supplies—Safety Guide Post Covers and Kwik-Klamp Toggle Clamps, is now being distributed to the trade. Also included are two complete lines of springs, one a new high pressure type representing an entirely new advance in die springs, according to the manufacturer. It is announced that Danly facilities for production and machining have been greatly expanded, and that standard sets and die makers' supplies are stocked at all eight branch warehouses of the Company. A copy of the 10th Edition Danly Catalog will be sent on request. Address Danly Machine Specialties, Inc., 2121 South 52nd Street, Chicago, Illinois.

THE ELASTIC STOP PRINCIPLE, whereby the nut is locked to the bolt through the action of a resilient non-metallic collar, is graphically explained in the 1939 catalog and data book of Elastic Stop Nut Corporation, now ready for distribution. This 56 page book contains comparative test data, suggestions as to where Elastic Stop Nuts can be used to advantage, numerous illustrations of applications in various industries and a complete listing of the standard nuts available. A copy will be sent on request made to Elastic Stop Nut Corporation, 1011 Newark Ave., Elizabeth, N. J. Dept. M.

TOOL ROOM GRINDING, an attractive 158 page 5 x 7" book by The Carborundum Company, is a practical treatise which systematically treats various tool room grinding operations by grouping the grinding wheel, the work being ground and the results obtained as units. The book is divided into sections describing abrasives and grinding wheels; methods of grinding all classes of tools, giving tool set-ups, recommended grinding wheels and results to be obtained; classes of grinding (surface, cylindrical, internal and the use of portable grinders); and a section of tables of useful information for the tool room and die shop operator with a tabulated summary of grinding wheels to be used for the operations described. A copy of "Tool Room Grinding" is yours for the asking. Write The Carborundum Company, Niagara Falls, N. Y. Dept. TD.

ZEH AND HAHNEMANN CO., manufacturers of mechanical power presses and automatic feeds have assembled circulars of leading types of presses which they manufacture, including reclinable power presses, selective multiple die punching presses, single and double crank power presses and their exclusive patent percussion power presses into a cover folder for trade distribution. The folder also includes a treatise on the manufacture of hot pressed brass parts, which are made on larger sizes of the last named presses. Several very interesting plates of "plastic machining", products of patent percussion power presses, are included. For a copy of the set or more complete information on any specific press write Zeh & Hahnemann Co., 187 Vanderpool Street, Newark, N. J.

V&O POWER PRESSES, new catalog No. T-39, is now being distributed by the manufacturers of this well-known line of Inclinable Open Back Presses. V&O Inclinables feature a double length slide, eccentric shaft, over-hanging bearing, positive non-clicking clutch and rigid ways construction. The catalog is well illustrated showing construction details and special applications. Punch-

ing and Shearing data, replacement charts and specifications of the entire line of 23 machines (14 carried in stock) make the catalog valuable for reference. For a copy of Catalog No. T-39, write the V&O Press Company, Inc., Hudson, N. Y.

New Literature Describes Contract Shop Services

THE Dayton Tool & Engineering Company has issued a folder which is illustrated with views of the company's shop and facilities and numerous special tools, dies and machines which have been built for production manufacturers. The company specializes in engineering service and emphasizes that a thoroughly modern plant with carefully maintained equipment provides excellent facilities for prompt deliveries.

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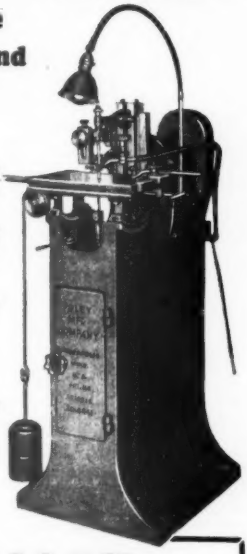

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Die Designing and Estimating

(Continued from page 20)

pilots in the cut-off punch is .4 hour each. Total .8 hour.

The stop is not the conventional pin type and while it cannot be classed as automatic it resembles that type sufficiently to justify using the lowest time value for making an automatic stop[11] which is 3.0 hours. This completes Column E.

Group F, Assembling and Tryout

Time values for assembling the parts of a die and its try-out cannot be easily standardized and here experience and good judgment of the estimator acquired by practice are vital. A safe allowance for mounting this die block and the stripper on the die shoe is 1.5 hours. Other time values for assembling according to table, Fig. 28,[12] are:

Mounting punches No. 1, No. 2 and No. 3 on punch pad—each 1.0 hr.

Mounting punch pad with assembled punches—includes time for peaning—1.5 hrs.

Mounting back and front gages (sectional die parts)—each .5 hr.

Mounting 4 perforators and 4 pilots—each .5 hr.

Mounting heel (sectional die part)—.5 hr.

Mounting stop holder (sectional die part)—.5 hr.

For try-out allow 2.5 hours. This is determined upon as a reasonable time because the die is not particularly complicated, although neither is it wholly conventional.

With the entry of the time values in Column F as shown, our estimate is complete. The total of 75 hours is a safe pre-determination of the time required for making this die.

[11]Fig. 25, August issue.
[12]Fig. 28, September issue.

Limited numbers of copies of issues from March through September, which contain all tables referred to in this installment, are still available at 10 cents per copy. TDM PROGRESS, 2460 Fairmount Blvd., Cleveland, O.

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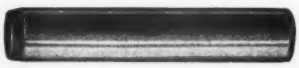

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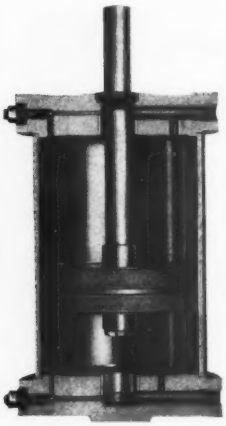

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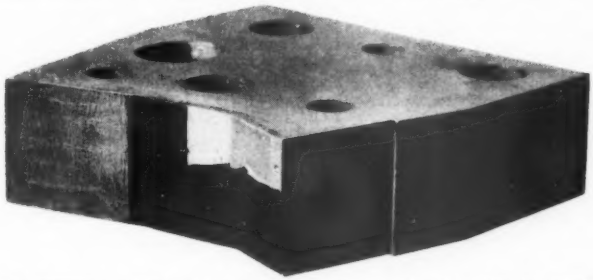

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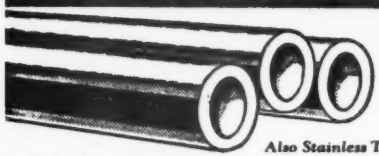

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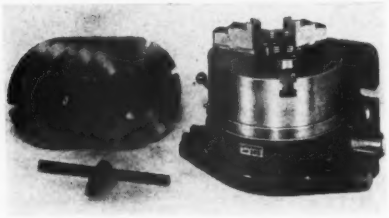

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149 Joseph Campau, Detroit

Jig Drilling in Two Planes

(Continued from page 14)

lines of the holes C and D were projected mathematically until they intersected the plane F-F, establishing points M and N (figure 3 showing these points will be published in the concluding installment).

Then by solving a series of simple right-angled triangles, the exact location of the center of each hole is determined.

Editor's note: The actual procedure in making the jig will be followed out in detail in the concluding installment to be published next month.

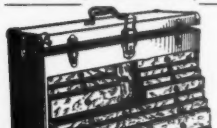
Gallmeyer & Livingston Tool Room Grinder

(Continued from page 27)

The No. 55 Precision Tool Room Type Machine, illustrated, has 12" x 36" working surface of table and sufficient longitudinal and transverse table movement to enable the operator to clear the entire working surface with the standard wheel. In addition to accuracy and speed, the automatic operation of this type of grinder makes it particularly valuable in the tool room. This type is available in sizes ranging from 6" to 18" working surface of table to 14" x 48".

The Gallmeyer & Livingston line also includes a number of production type machines, universal and tool grinder, cutter and reamer grinder and tap grinder.

For complete information on the Precision Tool Room Hydraulic Feed Surface Grinders and the location of the installation nearest you, write Gallmeyer & Livingston Co., 304 Straight Ave., Grand Rapids, Mich. Please mention TDM PROGRESS.



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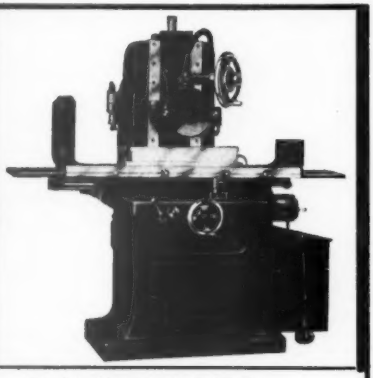

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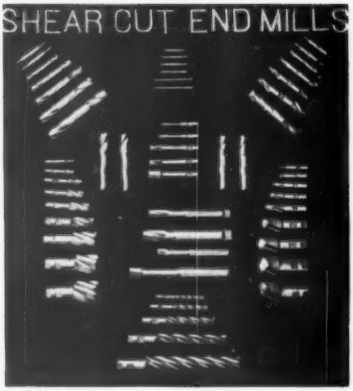

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STEELS

Immediate Shipment from Six Warehouses

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Reduce your tool and die costs with *Hy-ten "M" Temper, .70 Carbon Cr-Ni-Moly* oil hardening alloy steel. Extreme toughness at high degrees of hardness. Rounds, squares and flats in stock. Forgings of all types.

Send for descriptive folder

WHEELOCK, LOVEJOY & CO., INC.

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Putnam Tool Co. Opens New Plant Addition

IN order to have the production facilities necessary to meet the ever increasing demand for Putnam End Mills and other lines of Putnam cutting tools, the Putnam Tool Company of Detroit, Michigan, has recently completed a new plant addition. The new building, fronting on McDougall Avenue, forms an "L"

with the building on Charlevoix Avenue in which the company offices are located and where the factory space is now being modernized to provide the best in present-day working conditions.

The new addition, planned to house a portion of the milling and turning department, is modern in every detail. Glass brick has been used along one entire wall. The roof truss construction eliminates all columns, providing a clear expanse of floor space. The walls and ceiling are painted white with a wainscoting of light gray, which, with ample window area and the glass brick, assure excellent lighting during the entire day for every machine.

With this new building, the Putnam Tool Company now has adequate space for all present production operations as well as extra floor space which will be utilized as further expansion becomes necessary.

Bates Introduces Combination Arbor Press and Holder

A COMBINATION of an arbor press and Hercules Holder with Type and necessary fixtures for stamping name plates or parts with lettering or numbering is announced by H. O. Bates, well known manufacturer of marking devices and numbering machines.

In the past it was usually necessary to purchase a specially constructed type holder and an arbor press and make the

LONGER LIFE

You too, should be getting longer life between grinds.

Be wise and economize by sending your tools to SAL-WAY for heat treatment.

Write for full information

SAL-WAY—A National Steel Treating Service

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Only commercial heat treater using electrically heated and controlled Salt-Bath Method exclusively.

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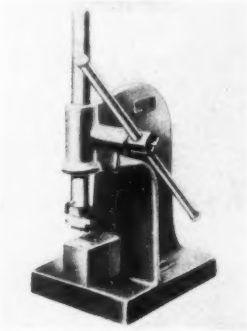
entire assembly to meet a marking need.

A square ram has been adopted to replace the round one illustrated because by so doing, parallel line stamping is positive. With the Hercules holder and type, letters or figures are instantly changed by simple pressure on the thumb clip. Since the standard arbor press has a leverage ratio of 50 to 1 it is suitable for stamping up to eight ⅛" size figures in stainless steel plates or the equivalent of four times this impression can be made in aluminum with ease by the average operator.



The anvil block has a pin adjustment and can be furnished with a wider face than illustrated for large name plates or parts. Individual machines are finished and adjusted to customer's specifications.

Hercules holders can be furnished for one or more lines of type and can be constructed to hold separate interchangeable dies to suit almost any marking job. The ease and speed with which interchangeability of repeat number stamping can be accomplished and the accuracy of the marking makes this outfit desirable for innumerable purposes.

For full details and prices write H. O. Bates, 251-257 No. Broad Street, Elizabeth, N. J. Please mention TDM PROGRESS.

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TOUGH
STEEL LETTERS & FIGURES, NUMBERING MACHINES, MARKING MACHINES, STAMPS & DIES
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MARKING PROBLEMS INVITED
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Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time of other methods and eliminate spoilage.

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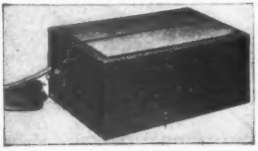

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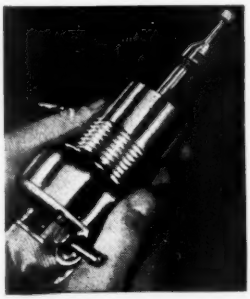


ONSRUD MACHINE WORKS, Inc., 3907 Palmer St., Chicago, Ill.

New Toggle Unit for Clamping To Angle-Form Part

A NEWLY developed toggle clamp which has a push link added to the handle and two additional toggle levers for swinging the lower toggle bar into position, to be used for clamping one part to an angle-form part, is announced by Knu-Vise, Incorporated.

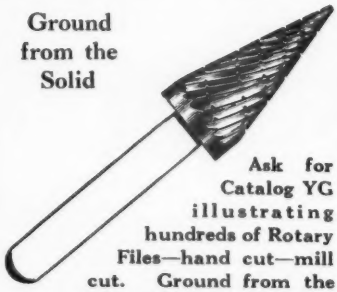
The new clamp is similar in basic construction to this company's standard toggle clamp and it is designed for use in set ups in which it is impossible to use the solid portion of the jig as support. The lower toggle bar clinches the components between itself and the upper toggle bar and in the particular operation pictured was the only possible method of doing the job. When released,

the complete mechanism swings completely out of the way, enabling the part being held to be easily removed. Two hundred of the new clamps were made for a motor car manufacturer, where they are in use on the inverted roof panels of automobiles. Other applications to refrigerator cabinets, metal furniture and tubing assemblies are particularly advantageous.

For full information on the new toggle unit write Knu-Vise, Incorporated, 6433 Cass Ave., Detroit, Mich. Ask for the name of the nearest dealer and supply source. Please mention TDM PROGRESS.

GROBET
ROTARY FILES

Ground from the Solid



Ask for Catalog YG illustrating hundreds of Rotary Files—hand cut—mill cut. Ground from the solid. Ask also for our Catalog YF illustrating more than 5000 different shapes, sizes and cuts of Grobet Precision Files, also files for all types of filing machines.

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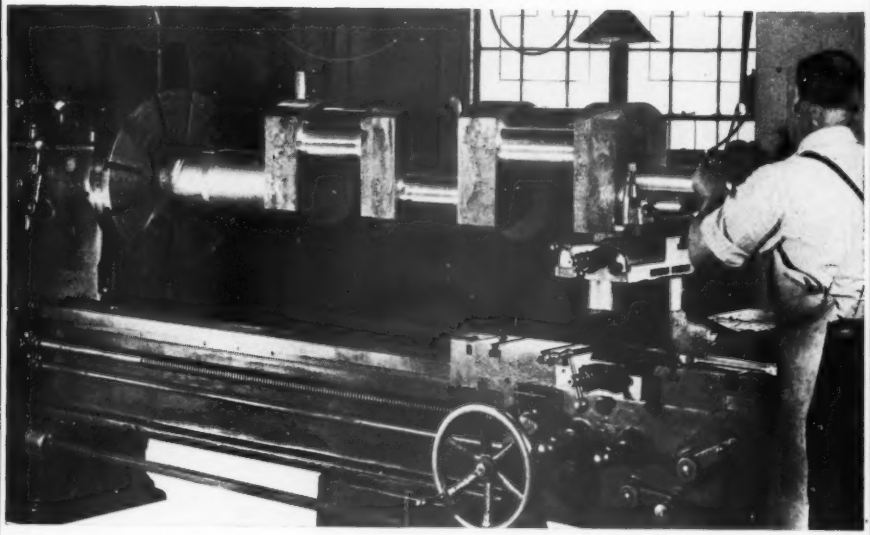
Emergency Service on EMPCO Crankshafts



A double-throw Empco Crankshaft being machined on one of our lathes —weight, 2 tons; length, 110"; pin diameter, 10"; throw, 6". Delivery 10 days after making of forging; total time, 2 weeks. Smaller crankshafts needed in emergencies, delivery one week.

A power press breakdown is a serious matter for most stamping plants. Delay in getting a press back into service is costly and can have far-reaching production results. Every day counts and we know how to "reduce" the days of machine idleness. Our facilities have been developed to meet the urgency of your needs. Our prices will show noteworthy savings over those of other supply sources. Let us prove it.

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Here is a steel that takes punishment standing up. It is alloyed of the purest base metals, melted, poured and forged under expert supervision, to achieve the highest physical properties. Scientific heat treatment brings out all the rugged qualities of this fine steel.

Forgings of EMPCO Crankshaft Steel normalize at 1650° with a Brinell hardness of 228-241 and have a tensile strength of 110,000. EMPCO Crankshafts are heated to 1550°, quenched and drawn to 900°, attaining a Brinell hardness of 262 to 300 and a tensile strength of 145,000 to 165,000 lbs. per square inch.

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